**Abstract**

Snowfall and snowmelt over the Himalayas exhibit considerable interannual variability. Observed climate data are few over the inaccessible regions of the Himalayas (especially western Himalayas). Consistency of satellite derived snow data with that of atmospheric re-analysis data has been studied and mechanism of snowfall and snowmelt variability has been studied over the western Himalayas.

 Characteristic similarity and differences of the climate variability over Karakoram region with that of adjoining Jammu and Kashmir and Himachal Pradesh has been studied. Dynamic downscaling simulations have been carried out using a regional climate model (RegCM) and the high-resolution WRF model. Sensitivity of cloud microphysics schemes in the WRF model indicates that a proper choice of microphysics scheme allows simulation of snowfall over the high mountain top or on the slopes. This study has been extended to examine the climate of the Himalayas in the climate change era.

The surface hydrology model (SWAT) has been used to simulate streamflow due to snowmelt and rainfall in Sutlej River and the need for observed data in the basin has been highlighted.